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Surveyors measure and record property boundaries and the topography of the land covered by construction and engineering projects. This measurement and the recorded data is called a “survey.” Surveys are used to establish legal boundaries, prepare maps and exhibits, and are the basis for written descriptions of land tracts that satisfy legal requirements.

Surveyors work to set land values, subdivide land into lots, and stake development sites. Surveyors also measure and chart the depths and expanses of underground areas, the ocean floor, the atmosphere, and outer space. Surveyors use mathematical reasoning ability to visualize objects, measure distances, sizes, and other abstract forms. They must be precise and accurate in their work because mistakes can be costly.

Global Positioning System (GPS) is the newest land surveying technology. GPS is an electronic system that uses information from earth-orbiting satellites to locate fixed points on the ground to establish survey lines.

Tasks

Teams or parties of two to four members usually conduct surveys. Survey party roles and tasks are detailed below:

Licensed Professional Land Surveyors (LPLS)

- ▶ Direct survey teams and take the legal responsibility for all survey results.
- ▶ Write descriptions of land for deeds, leases, and other legal documents.
- ▶ Research legal records for evidence of previous boundaries.
- ▶ Interpret and check GPS results.
- ▶ Prepare survey maps.
- ▶ Prepare subdivision maps.

Party Chiefs

- ▶ Plan and supervise daily activities of survey teams working directly under the LPLS.
- ▶ Verify the accuracy of measurements and calculations at survey sites.

Surveyors

Land Surveyor Technicians

- ▶ Operate standard and complex survey instruments to measure horizontal and vertical angles and GPS positioning.
- ▶ Use electronic distance-measuring instruments and GPS receivers.
- ▶ Compile notes, sketches, and records of measurement data.
- ▶ Operate data collection devices.

Surveyor Assistants (Rod and Chain Persons)

- ▶ Hold vertical rods in place while technicians sight them with special instruments called theodolites to establish distances and angles.
- ▶ Clear away brush and trees from the lines of a survey when needed.
- ▶ Set up traffic warnings and flag vehicles.
- ▶ Set survey stakes and monuments.

Survey teams spend some of their work hours in offices planning surveys, drawing maps, preparing reports, and performing computations for completed site surveys. Most private surveying and engineering firms separate field and office duties. Field personnel spend little time doing office duties.

Detailed descriptions of these occupations may be found in the Occupational Information Network (O*NET) at online.onetcenter.org.

Important Skills, Knowledge, and Abilities

- ▶ Mathematics — Using mathematics to solve problems.
- ▶ Writing — Communicating effectively in writing as appropriate for the needs of the audience.
- ▶ Reading Comprehension — Understanding written sentences and paragraphs in work-related documents.
- ▶ Engineering and Technology — Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
- ▶ Geography — Knowledge of principles and methods for describing the features of land, sea, and air masses, including their physical characteristics, locations, interrelationships, and distribution of plant, animal, and human life.
- ▶ Computer — Knowledge of hardware and software applications for drafting.
- ▶ Near Vision — The ability to see details at close range (within a few feet of the observer).
- ▶ Far Vision — The ability to see details at a distance.
- ▶ Science — Using scientific rules and methods to solve problems.

Work Environment

Members of survey teams spend a lot of time outdoors and work hard carrying heavy equipment long distances over rough country. Survey workers stand for long periods. They cut brush in the way of their work. They drive stakes with four- to eight-pound sledgehammers. They are out in all kinds of weather and can suffer sunburn, rash from poison oak, and snake and insect bites. On construction sites, there is danger from falling objects, moving vehicles, and heavy equipment. Survey work requires the skill to communicate by hand signals over great distances. Sometimes, workers must drive long distances to survey sites and, consequently, must have a valid California driver's license.

Many survey workers in the construction industry belong to the International Union of Operating Engineers. Surveyors working for government may join public employee unions.

Surveying teams usually work a five-day, forty-hour week, but many Surveyors work seasonally, especially in the construction industry, working during the dry weather months of March through November. According to the Southern California Joint Apprenticeship Committee, Surveyors work an average of 1,700 hours a year.

California's Job Outlook and Wages

The California Outlook and Wage table below represents the occupations across all industries.

Standard Occupational Classification	Estimated Number of Workers 2004	Estimated Number of Workers 2014	Average Annual Openings	2006 Wage Range (per hour)
Surveyors				
17-1022	5,100	5,800	240	\$26.66 to \$38.30
Surveying and Mapping Technicians				
17-3031	3,500	3,700	150	\$18.42 to \$31.46

Wages do not reflect self-employment.

Average annual openings include new jobs plus net replacements.

Source: www.labormarketinfo.edd.ca.gov, Employment Projections by Occupation and OES Employment & Wages by Occupation, Labor Market Information Division, Employment Development Department.

Trends

The growth rate for these two, relatively small occupations will be slower than average compared with all occupations in California. The use of electronic distance-measuring equipment and GPS may limit employment growth.

Training/Requirements/Apprenticeships

Surveyors usually follow one of the following training paths:

- ▶ Formal apprenticeship
- ▶ Extensive on-the-job training

California is the only state that has a formal apprenticeship program for Surveyors in the construction industry. Apprentices must be 18 years old or over, be able to perform all aspects of the work, and have a valid driver's license. Applicants to apprenticeship must have a high school diploma or an equivalent certificate and pass a qualification test. The apprenticeship program leads to journey-level Rod and Chain Person and then to Chief of Party and Certified Chief of Party.

The California Board for Professional Engineers and Land Surveyors licenses Surveyors who establish boundaries. Applicants need six years of land surveying experience to qualify for a license, including one year of responsible field training and one year of responsible office training. Graduates from an approved four-year curriculum in land surveying receive credit for four years of experience. The American Congress on Surveying and Mapping offers voluntary certification for Surveying Technicians. Progressive experience and passing written examinations certify technicians at four levels. Although not required for state licensing, many employers require professional certification for promotion to positions of greater responsibility.

Surveyors

Fresno State University offers a bachelor degree in surveying and mapping technology through the engineering department. California Polytechnical Institute at Pomona offers an engineering degree with a survey option.

Recommended High School Course Work

Those interested in surveying jobs should take courses in algebra, geometry, computer science, drafting, and mechanical drawing.

Where Do I Find the Job?

Candidates for training or apprenticeship programs should apply to a local office of the International Union of Operating Engineers. Direct application to employers is an effective job search method for journey-level Surveyors.

Use the *Search for Employers by Industry* feature on the *Career Center* page at www.labormarketinfo.edd.ca.gov to locate employers in your area. Search using keywords from the following construction industry names to get a list of private firms and their addresses:

- ▶ Architectural Services
- ▶ Building Inspection Services
- ▶ Drafting Services
- ▶ Engineering Services
- ▶ Geophysical Surveying & Mapping Services
- ▶ Landscape Architectural Services
- ▶ Other Surveying and Mapping Services
- ▶ Testing Laboratories

Search these **yellow page** headings for listings of private firms:

- ▶ Digital Engineers-Civil
- ▶ Engineers-Consulting
- ▶ Engineers-Earthquake
- ▶ Engineers-Environmental
- ▶ Engineers-Geotechnical
- ▶ Surveyors-Land
- ▶ Utility Companies

Where Can The Job Lead?

With experience, the career path leads to Rod and Chain Person or Land Survey Technician, then to Chief of Party. Chief of Party Surveyors can advance to Licensed Land Surveyors by meeting the work experience and written exam requirements of the California Board for Professional Engineers and Land Surveyors. Some Surveyors go on to management positions such as field engineers; others take advanced training to become civil engineers.

Other Sources of Information

International Union of Painters and Allied Trades
www.iupat.org

California Department of Industrial Relations, Division of Apprenticeship Standards
www.dir.ca.gov/das

California Land Surveyors Association
www.californiasurveyors.org

California Department of Consumer Affairs, Board for Professional Engineers and Land Surveyors
www.dca.ca.gov/pels